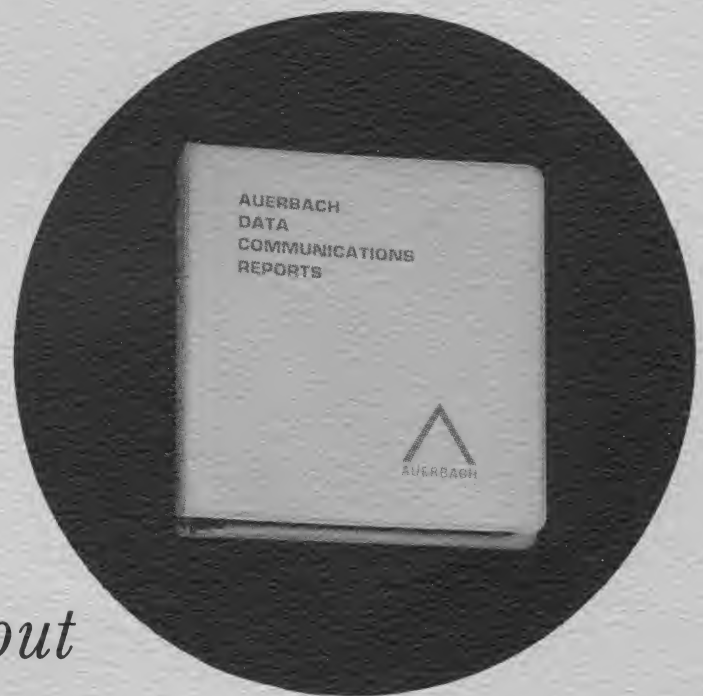


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- Comparison Charts . . . provides summary information on communications terminals and processing equipment, data sets, and Teletype equipment.

- Communications Terminal Equipment Reports . . . provides details on commercially available systems and components that can perform input-output functions in a data communications network.
- Communications Processing Equipment Reports . . . provides detailed analyses of multi-line controllers and computer equipment that can serve as the heart of a message-switching or management information system.
- Users' Guides . . . describes the standardized formats of the Equipment Reports and explains the meaning and significance of each of the numbered report entries.

A table of contents and sample report on the IBM 1050 is attached for your review.

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The following excerpts from
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illustrate the contents, format, and utility
of this unique new reference service.
Included are the table of contents,
“What it is—How to use it”, and
a typical equipment report.

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WHAT IT IS — HOW TO USE IT

. 1 WHAT IT IS

AUERBACH Data Communications Reports is an analytical reference service that provides the information you need in order to understand and apply the current technology and new developments in the most rapidly expanding area of the information processing field — data communications. The facts and objective appraisals in this service will help you to select and operate the facilities that will most effectively meet your data communications requirements. All of the information is arranged in standardized formats to permit rapid references and facilitate comparisons. Regular supplements keep you informed of significant new developments in the field.

AUERBACH Data Communications Reports is an extremely useful tool for every user and potential user of data communications systems. Like most tools, it can be used effectively or ineffectively, depending upon the user's understanding of the techniques involved. To ensure that all of the information in AUERBACH Data Communications Reports can be effectively employed in solving your data communications problems, we strongly recommend a thorough reading of the remaining material in this "What It Is — How To Use It" section.

. 2 STRUCTURE AND CONTENTS

AUERBACH Data Communications Reports is arranged in a looseleaf format with an open-ended numbering system to facilitate additions and revisions. The service currently consists of six major sections, identified by the divider tabs. Each section is subdivided into a series of reports on closely-related subjects, and most of the reports are further divided into numbered paragraphs. Brief explanations of the contents and purpose of each major section follow.

. 21 Reference Guides

The Reference Guides section includes the report you are now reading and a detailed Index. This material is designed to help you to utilize, as effectively as possible, all of the valuable information and advice that AUERBACH Data Communications Reports contains. The Index, arranged in straightforward alphabetical order, will guide you quickly to all the pertinent information about any specific device or general concept.

. 22 System Design

The System Design section presents clear-cut explanations of all of the basic concepts and techniques that must be understood by the designer (or informed user) of a data communications system, plus expert guidance in the procedure for defining system requirements and selecting communications facilities, terminal equipment, and processing equipment. Emphasis is placed upon the numerous possibilities for design "trade-offs," and upon the many ways in which the information in AUERBACH Data Communications Reports can be profitably applied throughout the system design process.

. 23 Common-Carrier Communications Facilities

This unique section contains detailed, quantitative information about one of the most important yet least understood aspects of the data communications field: the wide variety of communications facilities and services offered by the common carriers such as the Bell System and Western Union. Because of the numerous types of available facilities and the complexity of the applicable tariffs, definitive information about the capabilities and costs of these facilities is extremely difficult to obtain. The Common-Carrier Facilities section of AUERBACH Data Communications Reports — the product of an intensive study of the available facilities and the pertinent tariffs — overcomes this problem by defining the important characteristics, including illustrative costs, of each type of facility. To systematize and clarify the presentation, common-carrier facilities are divided into three major classes: narrow-band, voice-band, and broad-band. Each class is further divided into leased facilities, public switched services, and "packaged" multistation systems.

WHAT IT IS —
HOW TO USE IT

.24 Comparison Charts

These charts summarize, in formats designed to facilitate objective comparisons, the principal characteristics of commercially-available data communications equipment. The Comparison Chart entries describing Communications Terminal Equipment (page 4200:01) and Communications Processing Equipment (page 4400:01) have been extracted directly from the detailed Equipment Reports in the last two major sections of AUERBACH Data Communications Reports. The entries in these charts are quite comprehensive and largely self-explanatory, but the serious user is urged to turn to the detailed Equipment Reports to ensure that no important characteristic which could not be included in the Comparison Charts section is overlooked. Also included in the Comparison Charts section are summaries of the data sets available for use with common-carrier facilities (page 4600:01) and of the versatile line of data communications equipment manufactured by Teletype Corporation (page 4800:01).

.25 Communications Terminal Equipment

The reports in this section provide detailed information on the characteristics, performance, features, limitations, and costs of individual commercially-available data communications terminal devices. This category of equipment includes:

- Input/output devices that can serve as an interface between human operators and a communications line.
- Single-line communications terminals for general-purpose computers.
- Small general-purpose computers that can function efficiently as remote terminals for larger computer systems.

The Communications Terminal Equipment Reports are arranged in alphabetical order by manufacturer. Each report has the same standardized format to facilitate comparisons and ensure that no important characteristic will be overlooked. A Users' Guide (Report 6000), keyed to the Equipment Reports by means of corresponding paragraph numbers, explains the meaning and significance of each of the standardized report entries. Regular references to the appropriate Users' Guide entries will help you get the most out of the detailed information in the individual Equipment Reports.

.26 Communications Processing Equipment

This section contains a series of reports that provide detailed information on the characteristics, configurations, performance, limitations, and costs of individual U.S.-manufactured communications processing devices. This category of equipment includes:

- Freestanding communications processing systems with self-contained memory, processing, and input/output facilities.
- Multi-line controllers that enable multiple communications lines to be connected to a general-purpose computer system.

The Communications Processing Equipment Reports are arranged in alphabetical order by manufacturer. To facilitate comparisons and ensure that no important factor is overlooked, each report has the same standardized format. (Note, however, that the format of the Processing Equipment Reports is quite different from that of the Terminal Equipment Reports, as it must be to reflect the different functions and degrees of complexity of the two categories of equipment.) A Users' Guide (Report 8000), keyed to the Equipment Reports by means of corresponding paragraph numbers, explains the meaning and significance of each of the standardized report entries.

(Contd.)

. 3 REGULAR SUPPLEMENTS

Your copy of AUERBACH Data Communications Reports will be kept comprehensive and up to date by means of quarterly supplements. Each supplement will contain new reports on recently-announced data communications equipment, services, or techniques, and/or revised versions of previously-published reports to reflect changes in equipment characteristics and in the state of the art. A summary of the important new information and easy-to-follow filing instructions accompany each supplement. We recommend that you set up a standard procedure to ensure that each new supplement will be filed promptly and accurately.

. 4 THE NUMBERING SYSTEM

Throughout AUERBACH Data Communications Reports, each report is identified by a unique four-digit report number. The report number constitutes the first four digits of the page number at the top of every page within a given report. For example, the pages of Report 3200, Voice-Band Facilities, are numbered 3200:01, 3200:02, 3200:03, etc.

The basic unit of reference for material in AUERBACH Data Communications Reports, however, is not the page, but the paragraph. Referencing by paragraph number rather than by page number permits standardized report structures, ease of cross-referencing, simplicity of indexing, and convenient supplementation.

Every paragraph number consists of one, two, or three digits preceded by a decimal point. For example, Paragraph .3 of every Communications Terminal Equipment Report is titled "Input" and contains a description of the equipment's data input facilities; Paragraph .31 (a subdivision of Paragraph .3) is titled "Prepared Input" and describes the facilities for accepting input from previously-prepared media such as punched cards or tape. To look up the IBM 1050 Data Communications System's facilities for Prepared Input, you simply turn to Paragraph 6447.31; i.e., Paragraph .31 of Report 6447. (The proper report number for any specific equipment can be quickly located in either the sequentially-arranged Table of Contents on page 0100:01 or the alphabetically-arranged Index on page 1400:01.)

All report numbers, paragraph numbers, and page numbers throughout AUERBACH Data Communications Reports are strictly sequential, although there are many "gaps," or omitted numbers. These gaps help to keep the service "open-ended" by facilitating the insertion of new material in the most appropriate places.

. 5 DERIVATION AND RELIABILITY

AUERBACH Data Communications Reports is prepared and edited by experienced technical personnel, all of whom are members of the Technical Staff of AUERBACH Corporation.

In gathering, analyzing, and evaluating material for these reports, our staff starts with the specifications and manuals issued by the equipment manufacturers and other reliable sources. Extensive amplification and clarification of the generally-available specifications are usually obtained through visits to or correspondence with the manufacturers. The procedures that are involved in deriving certain standardized report entries from the manufacturers' specifications are clearly explained in the corresponding Users' Guide entries. Every effort is made to adhere to consistent terminology throughout AUERBACH Data Communications Reports; therefore, some of the terms used in our reports on a given manufacturer's equipment may, of necessity, differ from the terms used in the manufacturer's own literature.

Every report describing a specific manufacturer's equipment or services is sent to the manufacturer for review prior to publication. We invite the manufacturer's comments regarding the completeness and accuracy of the report. Where differences of opinion exist between a manufacturer and our staff, however, AUERBACH Data Communications Reports always reflects the opinion of our staff.

Where insufficient specific data is available, estimates may be used. All estimates or approximations are clearly identified as such. Where specific data is unavailable and an estimate is considered impractical, a question mark (?) is inserted in the published report to indicate that the manufacturer was unable or unwilling to supply the requested data.

.6 HOW TO USE THIS SERVICE EFFECTIVELY

The information in AUERBACH Data Communications Reports can meet many different needs, and you are likely to find new applications nearly every time you open it. A thorough reading of the System Design and Common-Carrier Facilities sections and of the two Users' Guides amounts to a concentrated course in data communications technology. The possibilities for casual yet rewarding "browsing" are virtually unlimited. Most of your data communications information needs, however, will probably fall within one of three classes:

- (1) Information about a specific device or concept is needed. How can it be located quickly?
- (2) Suitable data communications equipment must be selected for a particular application. How can the relevant equipment characteristics be determined and compared?
- (3) A data communications system must be designed or modified. What are the recommended design procedures, and how can the necessary information be obtained?

The recommended procedures for using AUERBACH Data Communications Reports to help you solve each of these three types of problems are outlined in the following paragraphs.

.61 Locating Specific Information

To locate the information pertaining to any specific device or concept, the Index (page 1400:01) should always be your starting point. Arranged in straightforward alphabetical order, the Index will guide you quickly to the exact report and paragraph that contains the information you need.

.62 Selecting Data Communications Equipment

The standardized format of AUERBACH Data Communications Reports is particularly valuable in the selection of equipment. First, turn to the Equipment Selection report (page 2300:01) for recommended selection procedures that will help you relate the equipment characteristics reported in AUERBACH Data Communications Reports to your specific requirements. Second, refer to the Comparison Charts of Communications Terminal Equipment (page 4200:01) or Communications Processing Equipment (page 4400:01) for summaries of the important characteristics of individual devices. The Comparison Charts will help you to determine quickly which of the numerous available devices are potentially suitable for your needs.

The devices that survive this "screening" process should now be studied in greater detail by turning to the appropriate Equipment Reports. The number of the Equipment Report describing any specific terminal or processing device can be quickly located in any of three places: the Comparison Charts, the Table of Contents, or the Index. Whenever you use the Equipment Reports, remember that the meaning and significance of every standardized report entry are explained in the correspondingly-numbered paragraph of the appropriate Users' Guide (page 6000:01 for Communications Terminal Equipment or page 8000:01 for Communications Processing Equipment).

.63 Designing a Data Communications System

When a new system must be designed or an existing system modified, the System Design section, beginning on page 2000:01, should be your starting point and your constant guide. The System Design section explains the basic concepts and techniques involved in data communications. It also furnishes clear-cut procedures for defining system requirements, selecting communications facilities, evaluating error control techniques, and selecting both terminal and processing equipment. The manner in which other information in AUERBACH Data Communications Reports can be effectively employed in all phases of the system design process is clearly explained.



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IBM 1050 DATA COMMUNICATIONS SYSTEM

.1 GENERAL

.11 Identity: IBM 1050 Data Communications System.

.12 Manufacturer: International Business Machines Corporation
Data Processing Division
112 East Post Road
White Plains, New York.

.13 Basic Function transmission of data over voice-band or narrow-band communications lines, and off-line data preparation or recording; input can be from punched cards, punched paper tape, or manual keyboard; output can be to punched cards, punched paper tape, or printed copy.

.14 Basic Components

Name: Control Unit.
Model number: 1051, Model 1, 2, or N1.
Function: controls other components.

Name: Printer-Keyboard.
Model number: 1052.
Function: printed output;
keyboard data entry;
off-line data preparation.

Name: Printer.
Model number: 1053.
Function: provides additional printing capability.

Name: Paper-Tape Reader.
Model number: 1054.
Function: reads punched tape data.

Name: Paper-Tape Punch.
Model number: 1055.
Function: punches data on paper tape.

Name: Card Reader.
Model number: 1056 Model 1 or 2.
Function: reads punched cards, one at a time
or in packs.

Name: Card Punch.
Model number: 1057.
Function: punches cards.

Name: Printing Card Punch.
Model number: 1058.
Function: punches and prints on cards.

Name: Programmed Keyboard.
Model number: 1092.
Function: numeric data entry.

. 14 Basic Components (Contd.)

Name: Programmed Keyboard.
 Model number: 1093.
 Function: numeric data entry.

. 15 Description:

The IBM 1050 Data Communications System consists of a group of slow-speed devices which can transmit data to or receive data from a 1050 system at another location via the public switched telephone network, the TWX network, a leased voice-band line, a leased common-carrier telegraph network (75 bits per second), or a privately-owned communications network. Data is transmitted at 14.8 characters per second over voice-grade or TWX facilities. Options permit transmission at 8.33 characters per second over leased telegraph facilities (75 bits per second). Data is transmitted in a half-duplex mode (i.e., bidirectional, but in only one direction at a time).

The 1050 system can also be used as a remote terminal with most IBM computer systems. Examples are the IBM 1440 or 1460 computer with the 1448 Terminal Control Unit, or the 1026 Transmission Control Unit, the 1410 and 7000 Series computers with the IBM 7750 Programmed Transmission Control, the IBM 7740 Communication Control System, and IBM System/360 computers with the 2701 Data Adapter Unit or either the 2072 or 2073 Transmission Control Unit.

The 1050 Data Communications System permits bidirectional transmission of data using punched cards, punched tape, printers, and keyboards. A 1050 system at one location consists of a 1051 Control Unit and one or more of the following units:

- 1052 Printer-Keyboard
- 1053 Printer
- 1054 Paper-Tape Reader
- 1055 Paper-Tape Punch
- 1056 Card Reader
- 1057 Card Punch (similar to IBM 24 keypunch).
- 1058 Printing Card Punch (similar to IBM 26 keypunch).
- 1092 Programmed Keyboard
- 1093 Programmed Keyboard.

The 1051 Control Unit is available in three models: Models 1, 2, and N1. Model 1 can operate in either a "line-loop" or a "home-loop" mode. In the line-loop mode, a 1050 station can communicate with remote terminals over a variety of communications facilities. In the home-loop mode, units not being used for data transmission can be interconnected to perform local operations such as the preparation of punched tape from keyboard input. Model 2 can be used only in the line-loop mode, and Model N1 can be used only in the home-loop mode. The primary use of Model N1 is for console facilities for some models of an IBM System/360 computer system.

When equipped with the Master Station special feature, a 1051 Model 1 or 2 Control Unit can initiate polling or addressing operations on a multistation line. Up to 26 1050 systems can communicate over a single leased line, although only one station at a time can transmit. The "polling station" transmits a station code followed by a device address code. If a positive response is received, the remote unit is ready to send data. If a negative response or no response is received, another station or device on the line can be polled. The "addressing station" transmits a code, as in polling. If a positive response is received, the sending device (keyboard, card reader, or punched tape reader) is started.

(Contd.)

Error control is handled on a character and message basis. The transmitting terminal inserts an odd parity bit into both keyboard-originated characters and characters read from punched cards prior to transmission. Punched tape characters already contain parity bits. A longitudinal redundancy check character (message parity) is sent at the end of each block of data after the end-of-block character. Character and message parity are checked at the receiving terminal, and if an error is sensed, indicator lamps are turned on at both terminals and transmission is stopped. With the optional feature of Line Correction and Automatic Reread (for card and punched tape), the message is automatically transmitted two more times after error indication, before manual intervention is required.

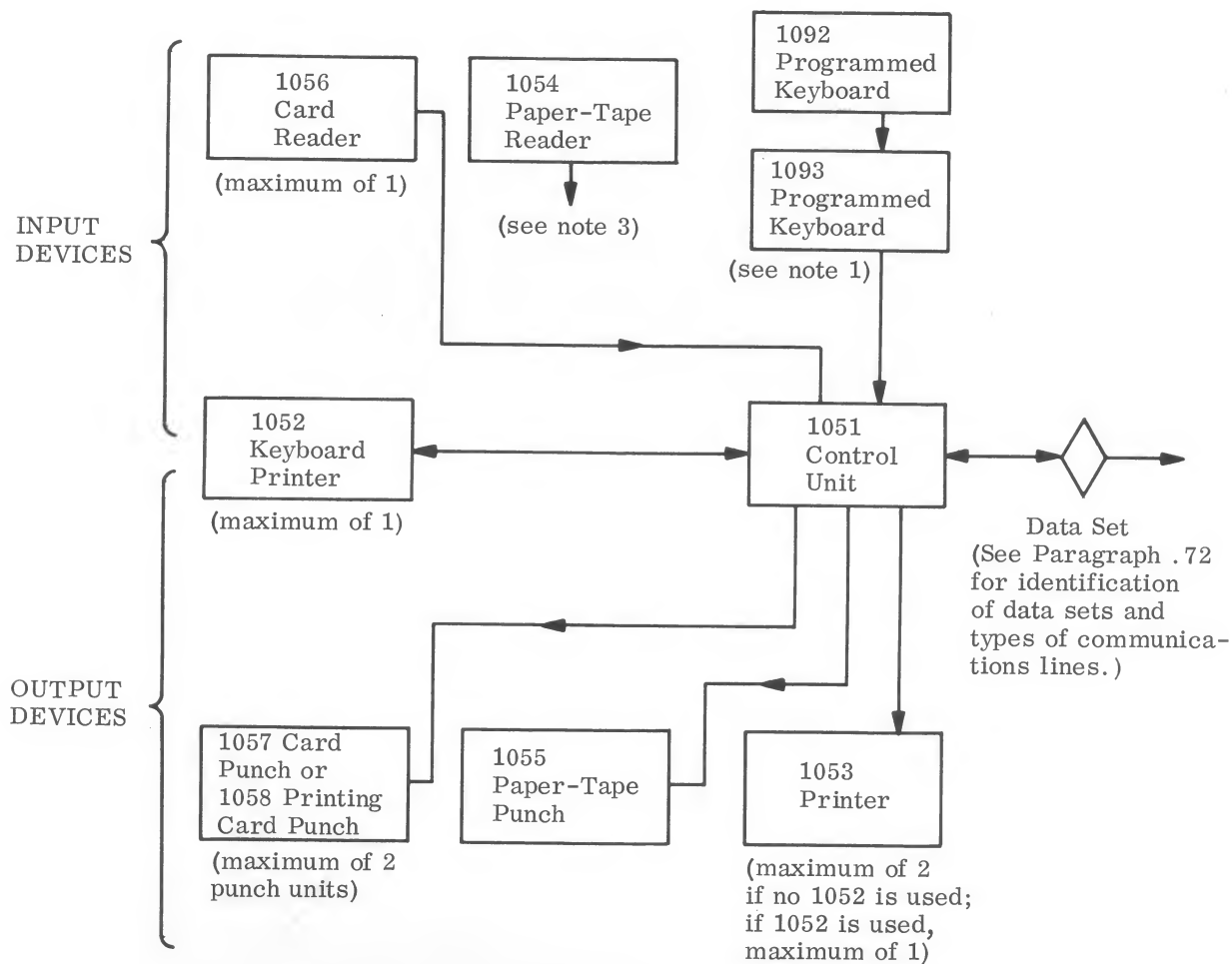
Some of the more important optional features available for the different models of the 1051 Control Unit include:

- Line Correction (Models 1 and 2): Permits automatic retransmission of data from a 1054 Paper Tape Reader or 1056 Card Reader when an error is detected. When punching with a 1055 Paper Tape Reader, the error block is deleted and repunched; when punching cards with the 1057 or 1058 Card Punch, the card is ejected without a punch in column 81 and a new card is punched.
- Master Station (Models 1 and 2): Permits a 1050 station to perform polling and addressing operations in a multistation network.
- Home Component Recognition (Models 1 and N1): Permits automatic selection of units from a group being operated in a home-loop mode.
- Automatic Ribbon Shift and Line Feed Select (all Models): Permits shifting to upper or lower portion of ribbon and selection of single or double line feed in response to certain control codes.
- Line Adapters (Models 1 and 2): Permits connection to voice-band communication lines. This option provides the necessary modulation and demodulation of the data signals and can be used in place of common-carrier data sets where permitted. One model allows up to four 1050 systems to simultaneously share one voice-band line.
- Home Correction (Models 1 and N1): Provides facilities for error correction in the home-loop mode when preparing punched tapes. These facilities enable an operator to backspace and punch delete codes manually, one character at a time, or to backspace and punch delete codes through an entire record automatically.

- .16 First Delivery: January, 1964.
- .17 Availability: maximum of 6 months.

. 2 CONFIGURATION

(Maximum of 2 reader devices and programmed keyboard units.)



Notes: (1) The 1092 and 1093 Programmed Keyboards are shown connected in tandem. These keyboards need not operate in tandem; either can be connected directly to a 1051 Control Unit.

(2) A Maximum configuration is shown. A 1051 station need include only the desired units; for example, a minimum system could include only a 1051 Control Unit and a 1053 Printer.

(3) For strict accuracy, the 1054 is not shown connected to the 1051 because this connection would exceed the maximum number of allowable reader and programmed keyboard devices connected to the 1051.

(Contd.)

. 3 INPUT

. 31 Prepared Input

1054 Paper-Tape Reader -

Input medium:	fully punched, 1-inch, 8-level paper tape. edge-punched documents (optional feature).
Input code:	6-bit code plus parity, called IBM Perforated Tape and Transmission Code for 6-Bit Environments; see Table I.
Quantity of data:	variable.
Character set:	full alphanumeric plus specials.
Rated input speed:	14.8 or 8.33 char/sec, depending on communi- cations facility.
Effective speed:	depends upon block lengths.
Comments:	data read from paper tape can be printed locally, but not punched, while transmitting. feeding of paper tape from the center of the tape roll to allow reading the tape in the same order as punched is provided as an optional feature.

1056 Card Reader, Models 1 and 2 -

Input medium:	standard IBM 80-column punched cards (22 or 51-column cards with an optional feature.)
Input code:	standard Hollerith card code; see Table I.
Quantity of data:	single card, read by column. pack of up to 300 cards (Model 1, with optional feature).
Character set:	see Table I.
Rated input speed:	14.8 or 8.33 characters (columns) per second, depending on communications facility.
Effective speed:	approximately 10 fully-punched cards per minute when reading from pack.
Comments:	optional feature permits use of a punched paper tape control loop to control card passage through reader.

. 32 Manual Input

1052 Printer Keyboard -

Method of entry:	via a 53-key keyboard.
Quantity of data:	variable.
Character set:	88 characters, including upper and lower-case alphabets, numerics, punctuation, and special characters; see Table I.
Comments:	output can be transmitted, or keyboard can be used in local "home unit" operations to pre- pare paper tape, cards, or printed records.

IBM 1092 Programmed Keyboard, Models 1 and 2 -

Method of entry:	via a 15-column keyboard (Model 1) or 16- column keyboard (Model 2). Each column contains 10 keys.
Quantity of data:	15 or 16 digits, depending on model.
Character set:	digits 0 through 9 only; optional feature permits multiple keys to be depressed in the last two columns and the result to be sent as four 5-bit characters.

. 32 Manual Input (Contd.)

Comments: can be used in tandem with 1093 to send up to 26 digits of data. With Model 2, up to 48 different coded overlays can be recognized. The overlay code is transmitted with the data.

1093 Programmed Keyboard, Models 1 and 2 -

Method of entry: via a 10-column keyboard. Each column contains 10 keys.
 Quantity of data: 10 digits.
 Character set: digits, 0 through 9 only; optional feature permits multiple keys to be depressed in the last two columns, and the result to be sent as four 5-bit characters.
 Comments: can be used in tandem with 1092 to send up to 26 digits of data. With Model 2, up to 48 different coded overlays can be recognized. The overlay code is transmitted with the data.

. 34 Transaction Code Input: no special provision.

. 35 Message Configuration: messages are variable in length; control characters are used for device control and for message control.

. 36 Operating Procedure

For point-to-point operation, the operator can initiate a connection by dialing another station and verifying that the other station is ready for a period of transmission. If the Master Station Feature is installed, remote components can be automatically polled or addressed. The operator can insert successive message cards; each card contains the receiving unit's address for each message. The optional Pack Feed Feature allows up to 300 cards to be sent without operator attention. Multiple messages can be sent by paper tape without operator attention, once the tape has been initially positioned.

For multistation operation, the keyboard, paper tape reader, or card reader can be used to provide either polling or addressing characters for remote stations. Messages are automatically received following polling. Errors are indicated and require manual intervention according to preset procedures. A special feature allows for two additional attempts to send a message in which an error has been detected.

After addressing for transmission requests, the operator may key the message to the addressed unit. If the message is in a machine-readable form, the paper tape reader or card reader automatically sends the message (one block of indefinite length on paper tape, or one or several cards) to the addressed unit. Pressing the system reset button, when using tape or cards, automatically initiates polling and transmission.

When the 1050 system is connected via communications lines to a computer system, all polling and addressing are controlled by the computer.

. 37 Entry of Time and Date: no special provision.

. 4 OUTPUT. 41 Output to Punched Tape

1055 Paper-Tape Punch -

Tape size: chad (fully punched) 1-inch, 8-level paper tape.
 Chad edge-punched documents (optional feature).

(Contd.)

Tape code:	6-bit code plus parity, called IBM Perforated Tape and Transmission Code for 6-bit environments; see Table I.
Rated punching speed:	14.8 or 8.33 char/sec, depending on communication facility.
Effective speed:	depends upon block length.
Format control:	a hole is punched in level 8 for start of message block, beginning of each data line, error control or manual delete codes (optional features).
Comments:	power-driven take up reel is available optionally.

.42 Output to Punched Cards

1057 Card Punch;
1058 Printing Card Punch -

Card type and size:	standard IBM 80-column cards.
Card code:	standard Hollerith code, or extended Card Code (optional); see Table I.
Rated punching speed:	14.8 or 8.33 characters (columns) per second, depending on communication facility.
Effective speed:	approximately 10 fully-punched cards per minute.
Format control:	program card.
Comments:	these units are similar to the IBM Model 24 and 26 keypunches, respectively. The 1058 prints the data at the top of each column under control of the operator or program card.

.44 Output to Printer

1052 Printer Keyboard;
1053 Printer -

Output medium:	friction-fed forms up to 15 inches in width. pin-fed forms in 12 widths from 5.25 to 13.12 inches (optional). maximum printed line length is 13 inches. printing is 10 or 12 characters per inch horizontally and 6 or 8 lines per inch vertically. fan-fold forms up to 15 inches in width can be fed and stacked.
Character set:	88 characters, including upper and lower-case alphabets, numerics, punctuation, and special characters; see Table I.
Rated printing speed:	14.8 or 8.33 char/sec, depending on the communication facility.
Effective speed:	somewhat below rated speed due to carriage return, line feed, and other operations.
Format control:	controlled by function codes; functions include line feed, carriage return, case shift, back-space, and horizontal tab.
Comments:	printing mechanism is similar to IBM Selectric Typewriter.

TABLE I: IBM 1050 DATA CODES

LOWER CASE					PTT CODE/6 Tape Track								UPPER CASE						
STANDARD CARD CODE	CHARACTER SET				8	7	6	5	4	3	2	1	CHARACTER SET				STANDARD CARD CODE	EXTENDED CARD CODE	
	Std.	A	H	Typ.	Bit Value								Std.	A	H	Typ.			
12-8-3						B	A		8		2	1				12-8-3	12-8-1		
11-8-3		\$		i		B		C	8		2	1		I	:	11-8-3	11-8-2		
0-8-3							A	C	8		2	1				0-8-3	0-8-1		
8-3		#	=	'					8		2	1		±	#	"	8-3	0-8-7	
8-4		@	'	1/2			A							¢	Δ	1/4	8-4	11-8-7	
12		&	+	=		B	A	C						+	<	+	12	12-8-6	
11						B								—	\	—	11	0-8-6	
0-1		/					A	C				1		?			0-1	12-8-2	
1		1										1		=	>	±	1	8-6	
2		2									2			□)	@	2	12-8-4	
3		3						C			2	1			i	#	3	11-8-6	
4		4								4				:	;	6	4	8-2	
5		5						C		4		1			%	(%	5	0-8-4
6		6						C		4	2			'	:	c	6	8-5	
7		7								4	2	1			"	&	7	8-1	
8		8							8						*		8	11-8-4	
9		9						C	8			1		([(9	12-8-5	
0		0						C	8			2)])	0	11-8-5	
12-1		a				B	A					1		A			12-1	12-0-1	
12-2		b				B	A				2			B			12-2	12-0-2	
12-3		c				B	A	C			2	1		C			12-3	12-0-3	
12-4		d				B	A			4				D			12-4	12-0-4	
12-5		e				B	A	C		4		1		E			12-5	12-0-5	
12-6		f				B	A	C		4	2			F			12-6	12-0-6	
12-7		g				B	A			4	2	1		G			12-7	12-0-7	
12-8		h				B	A		8					H			12-8	12-0-8	
12-9		i				B	A	C	8			1		I			12-9	12-0-9	
11-1		j				B		C				1		J			11-1	12-11-1	
11-2		k				B		C			2			K			11-2	12-11-2	
11-3		l				B					2	1		L			11-3	12-11-3	
11-4		m				B		C		4				M			11-4	12-11-4	
11-5		n				B				4		1		N			11-5	12-11-5	
11-6		o				B				4	2			O			11-6	12-11-6	
11-7		p				B		C		4	2	1		P			11-7	12-11-7	
11-8		q				B		C	8					Q			11-8	12-11-8	
11-9		r				B			8			1		R			11-9	12-11-9	
0-2		s					A	C			2			S			0-2	11-0-2	
0-3		t					A				2	1		T			0-3	11-0-3	
0-4		u					A	C		4				U			0-4	11-0-4	
0-5		v					A			4		1		V			0-5	11-0-5	
0-6		w					A			4	2			W			0-6	11-0-6	
0-7		x					A	C		4	2	1		X			0-7	11-0-7	
0-8		y					A	C	8					Y			0-8	11-0-8	
0-9		z					A		8			1		Z			0-9	11-0-9	
THE CODES BELOW ARE NOT PRINTABLE																			
BLANK		SPACE				C								SPACE		BLANK	BLANK		
0-8-2		*				A								*		0-8-2	12-8-7		
11-0		MZ				B								✓		11-0	0-8-5		
12-0		PZ				B A C								✓		12-0	8-7		
FUNCTION CODES																			
9-4		PN				C								Punch On					
0-9-4		BY				A								Bypass					
11-9-4		RES				B								Restore					
12-9-4		PF				B A C								Punch Off					
9-5		RS				8								Reader Stop					
0-9-5		LF				A C								Line Feed					
11-9-5		NL			X†	B C								New Line (Carrier Return and Line Feed)					
12-9-5		HT				B A								Horizontal Tab					
9-6		UC				8								Upper Case					
0-9-6		EOB				A C								End of Block					
11-9-6		BS				B C								Backspace					
12-9-6		LC				B A								Lower Case					
9-7		EOT				C								End of Transaction					
0-9-7		PRE				A								Prefix					
11-9-7		IL				B								Idle					
12-9-7		DEL				B A C								Delete					

NOTE: The tape feedholes are located between the 4-bit and the 8-bit.

† This 8th track punch is punched into tape with the NL code when the 1050 system has either the Line Correction or Home Correction special features (or both) installed. This punch is not included in the parity check of the NL character.

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(Contd.)

. 5 ERROR DETECTION AND CORRECTION

. 51 Data Entry Errors

Type of checking: no checking.

. 52 Data Transmission Errors

Type of checking: an odd parity bit is attached to each character transmitted and is checked by the receiving terminal.
a longitudinal redundancy check character (LRC) is generated for the entire message and is checked by the receiving terminal.

Error indication: if a parity error occurs, a hyphen character is punched on all receiving tape punches, a hyphen or underscore character (depending on shift status) is typed on all receiving printers, the data check light at the receiving station is turned on, and the receiving station is caused to generate negative answers to the LRC.
if LRC characters are unequal, the receiving terminal data-check light is turned on, a hyphen character is sent to the transmitting terminal, and the transmitting device halts.

Correction procedure: manual intervention.
two automatic retransmissions (with optional feature).

Comments: all error detection is controlled by the 1501 Control Unit.

. 53 Data Recording Errors

Type of checking: no checking.

Comments: when punching cards, an "X" punch is punched in column 81 to indicate that the data on the card has passed the LRC check.

. 55 Line Malfunctions: no special provisions for checking.

. 6 CONDITION INDICATORS

The 1052 Printer Keyboard contains all important switches and lamps. If the 1050 station does not include a 1052, the switches and lamps are located in a separate switch unit.

Input device available: none
Input device busy: none.
Remote receiver ready: lamp (optional).
Remote receiver busy:* lamp.
Power on: lamp.
Improper data entry: none.
Transmission error: lamp.
Recording error: none.
Request to send data: lamp.

* This condition is recognized by the remote terminal sending a negative response or no response. Except when polling, this is equivalent to an error condition. When polling, and a negative response or no response is received, the polling continues with no indication.

. 7 DATA TRANSMISSION

The 1051 Control Unit is the interface between all 1050 system components and a communications data set. Only one component can transmit or receive at a time.

. 71 Basic Characteristics

Rated transmission speed: 14.8 char/sec (133.2 bits/sec) on voice-grade lines.
 8.33 char/sec (75 bits/sec) on telegraph-grade lines.
 Transmission method: serial by bit.
 Transmission code: IBM Standard Perforated Tape and Transmission Code; see Table I.
 a total of nine bits, including start, stop, and parity bits, are transmitted for each character.
 Transmission mode: half-duplex.
 Order of bit transmission: B, A, 8, 4, 2, 1, C; see Table I.
 Synchronization: start and stop bits are transmitted with each character.

. 72 Connection to Communications Lines

<u>Communication Line</u>	<u>Data Set*</u>
Common-carrier leased telegraph-grade lines (75 bits/sec):	none required.
Bell System Schedule 3A Data Channel (150 bits/sec):	Bell System Data Set 103F.
Western Union Class D Data Channel (180 bits/sec):	Western Union 180 Baud Data Modem.
Common carrier leased voice-band line:	Bell System Data Set 103F or Western Union 180 Baud Data Modem.
Public switched telephone network or Bell System TWX CE network:	Bell System Data-Phone Data Set 103A.
Privately-owned voice-band network:	furnished by IBM.

. 73 Transmission Control

Call initiation: manually by operator, or by polling or addressing by master station.
 Call reception: capable of unattended operation.
 Functional operations: 16 different function codes can be received from a remote station to perform a variety of functions such as turning punch on, line feed, and carriage return.

. 74 Multistation Operation

Polling: the master station transmits a two-character code specifying a particular station and a specific device. The polled station responds with a negative response or a positive response followed by text. If no response is received within two seconds, polling is continued.

* In some cases equivalent data sets can be used; see your local common-carrier communications consultant.

(Contd.)

Addressing:

polling can be performed manually via the keyboard or automatically via a paper tape reader or card reader. Sequence of polling is determined by the operator via the keyboard or as punched in the paper tape or card.

the master station sends a station device code to a particular station which will receive the succeeding message.

addressing can be controlled through manual operation of keyboard, by paper tape reader, or card reader. If the addressed station responds positively, message transmission may begin. If the addressed station responds negatively, the next station on the line is addressed; if no response is received, the data check light is turned on.

.8 PHYSICAL SPECIFICATIONS

Component:	1051 Control Unit †	1052 Printer- Key- board	1053 Printer	1054 Paper- Tape Reader	1055 Paper- Tape Punch	1056 Card Reader	1057 Card Punch	1058 Printing Card Punch
Width (inches)	26	23	23	13.75	15.375	12.5	31	31
Depth (inches)	15	19.75	11.5	13	17.125	15	28	28
Height (inches)	27	9	9	6.375	8.25	27	39	39
Weight (lbs.)	195	65	35	20	26	40	215	215
Power (KVA)	0.375	0.115	0.115	0.115	0.115	0.200	0.420	0.420
Voltage	115 (208/ 230 op- tional)							
Frequency (cps)	60							
Phases	1							
Temperature range, °F	50-100	50-100	50-100	50-100	50-100	50-100	50-100	50-100
Humidity range, %	10-80	10-80	10-80	10-80	10-80	10-80	10-80	10-80
Heat (BTU, hr)*	1280	392	392	870	870	690	1433	1433

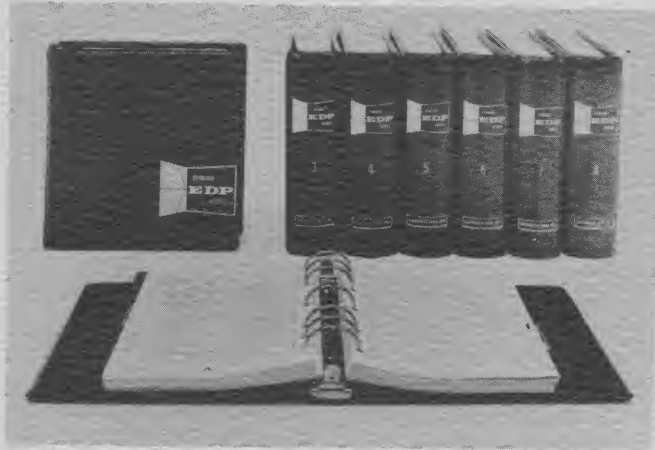
* Based on maximum usage of optional features.

† The 1051 Control Unit supplies power to each component.

.9 PRICE DATA

Component or Feature	Monthly Rental, \$	Purchase Price, \$	Monthly Maintenance, \$
1051 Control Unit —			
Model 1	110.	5,790.	2.25
Model 2	60.	3,050.	2.00
Model N1	60.	3,050.	2.75
1051 Special Features —			
Line Correction	10.	560.	0.75
Master Station	15.	820.	0.50
Home Component Recognition	3.	135.	0.25
Line Adapter	10.	450.	0.50
Home Correction	10.	560.	0.50
Automatic Ribbon Shift and Line Feed Select	3.	105.	0.25
First Printer Attachment (Models 1 and 2 only)	10.	500.	0.50
Second Printer Attachment	10.	500.	0.50
First or Second Punch Attachment	5.	275.	0.25
First Reader Attachment	10.	550.	0.25
Second Reader Attachment	5.	275.	0.25
1052 Printer-Keyboard	65.	2,930.	7.75
1053 Printer	50.	2,200.	7.00
1054 Paper-Tape Reader	30.	1,550.	3.00
1055 Paper-Tape Punch	40.	2,025.	4.50
1056 Card Reader —			
Model 1	70.	3,625.	5.50
Pack Feed Feature	5.	185.	0.50
Model 2 (no provision for Pack Feed Feature)	60.	3,125.	4.25
1057 Card Punch	75.	3,325.	16.00
1058 Printing Card Punch	95.	4,300.	18.00
Programmed Keyboard —			
1092 Model 1	35.	1,400.	2.00
1092 Model 2	40.	1,600.	4.50
1093 Model 1	30.	1,200.	1.25
1093 Model 2	35.	1,400.	3.50
Special Features (all models)			
1051 Attachment	7.	280.	1.00
Multiple Key Depression	7.	280.	0.50
Tandem Operation	—	—	—

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